

# Claims

- [c1] A bipolar transistor, comprising:
  - a collector;
  - an intrinsic base overlying said collector;
  - an emitter overlying said intrinsic base; and
  - an extrinsic base spaced from said emitter by a gap, said gap including at least one of an air gap and a vacuum void.
- [c2] A bipolar transistor as claimed in claim 1, wherein said gap includes only an air gap.
- [c3] A bipolar transistor as claimed in claim 1, wherein said gap includes only a vacuum gap.
- [c4] A bipolar transistor as claimed in claim 1, wherein said bipolar transistor further includes a semiconductor layer overlying said intrinsic base, wherein said emitter and said extrinsic base overlie said semiconductor layer.
- [c5] A bipolar transistor as claimed in claim 4, wherein said gap overlies an opening in said semiconductor layer.
- [c6] A bipolar transistor as claimed in claim 5, further comprising a solid dielectric material disposed on said in-

trinsic base in said opening.

- [c7] A bipolar transistor as claimed in claim 2, further comprising a solid dielectric material having a lower surface disposed over said gap and an upper surface underlying an overhanging portion of said emitter.
- [c8] A bipolar transistor as claimed in claim 1, wherein said bipolar transistor includes a raised extrinsic base, wherein said raised extrinsic base includes a polycrystalline semiconductor layer and a low resistance layer disposed above said polycrystalline semiconductor layer, said low resistance layer including at least one material selected from metals and metal silicides.
- [c9] A bipolar transistor as claimed in claim 8, wherein said low resistance layer includes a silicide.
- [c10] A bipolar transistor as claimed in claim 1, wherein said intrinsic base includes a layer of a single-crystal semiconductor alloy, said single-crystal semiconductor alloy forming a heterojunction with at least one of said emitter and said collector.
- [c11] A method of making a bipolar transistor, comprising:  
forming a collector and an intrinsic base overlying said collector;  
forming an emitter overlying said intrinsic base and an

extrinsic base spaced from said emitter by a gap, said gap including at least one of an air gap and a vacuum void.

- [c12] A method of making a bipolar transistor as claimed in claim 11, wherein said gap includes only an air gap.
- [c13] A method of making a bipolar transistor as claimed in claim 11, wherein said gap includes only a vacuum gap.
- [c14] A method of making a bipolar transistor as claimed in claim 11, further comprising making a semiconductor layer overlying said intrinsic base, wherein said emitter and said extrinsic base overlie said semiconductor layer.
- [c15] A method of making a bipolar transistor as claimed in claim 14, further comprising forming an opening in said semiconductor layer and forming said gap over said opening.
- [c16] A method of making a bipolar transistor as claimed in claim 15, further comprising forming an oxide disposed on said intrinsic base in said opening.
- [c17] A method of making a bipolar transistor as claimed in claim 12, further comprising forming a region of solid dielectric material having a lower surface disposed over said gap and an upper surface underlying an overhang—

ing portion of said emitter.

- [c18] A method of making a bipolar transistor as claimed in claim 11, wherein said extrinsic base is formed as a raised extrinsic base including a polycrystalline semiconductor layer and a low resistance layer disposed above polycrystalline semiconductor layer, said low resistance layer including at least one material selected from metals and metal silicides.
- [c19] A method of making a bipolar transistor as claimed in claim 18, wherein said low resistance layer includes a salicide.
- [c20] A method of making a bipolar transistor as claimed in claim 11, wherein said intrinsic base is formed to include a layer of a single-crystal semiconductor alloy, said single-crystal semiconductor alloy forming a heterojunction with at least one of said emitter and said collector.